Estimating River Discharge from Aerial Imagery

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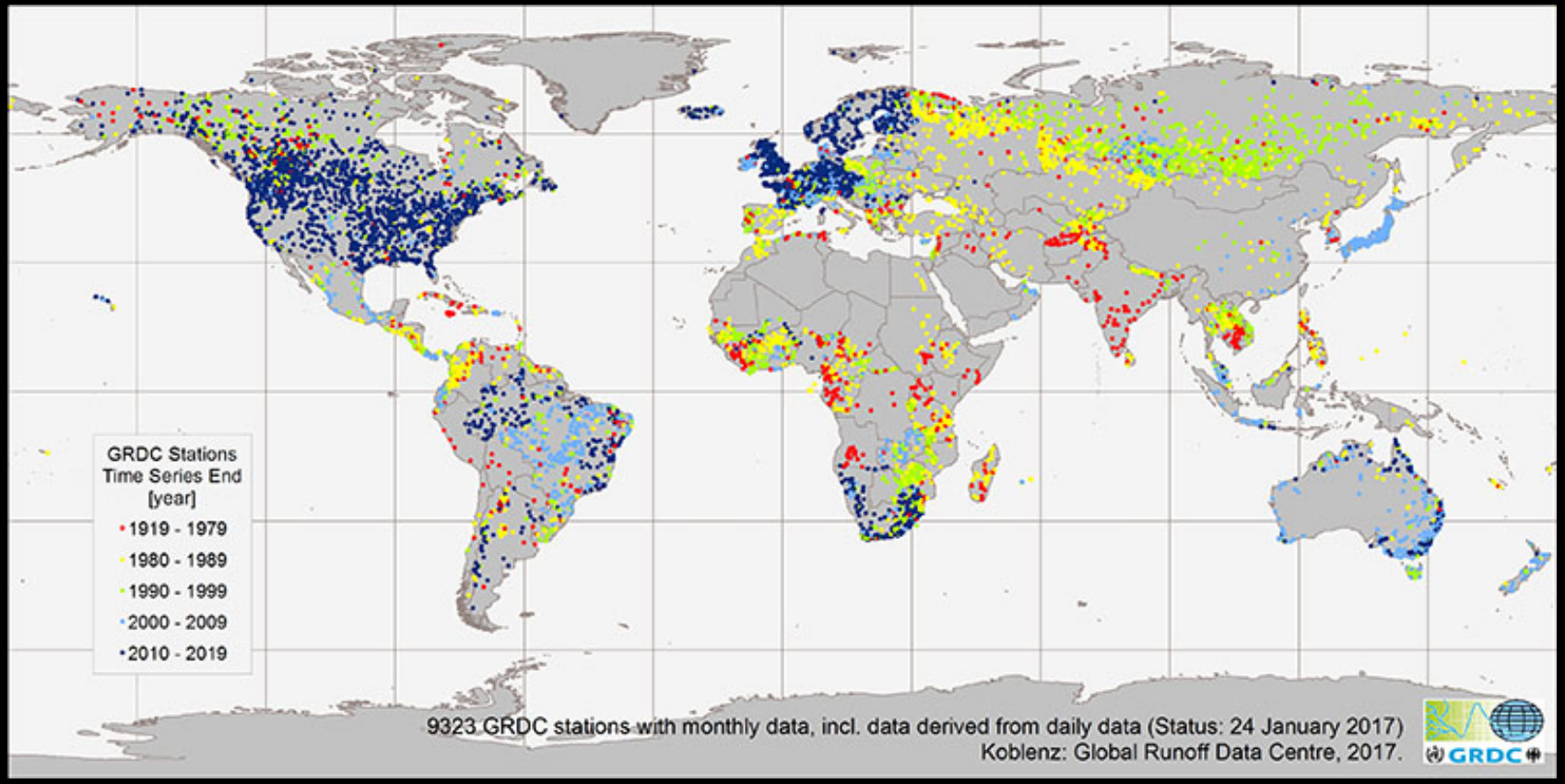
Credit:
Craig Weiss, USGS.

Credit:
USGS California Water Science Center

Global Decline in River Gauging Stations



http://www.bafg.de/GRDC

The Rise of Remote Sensing of River Discharge

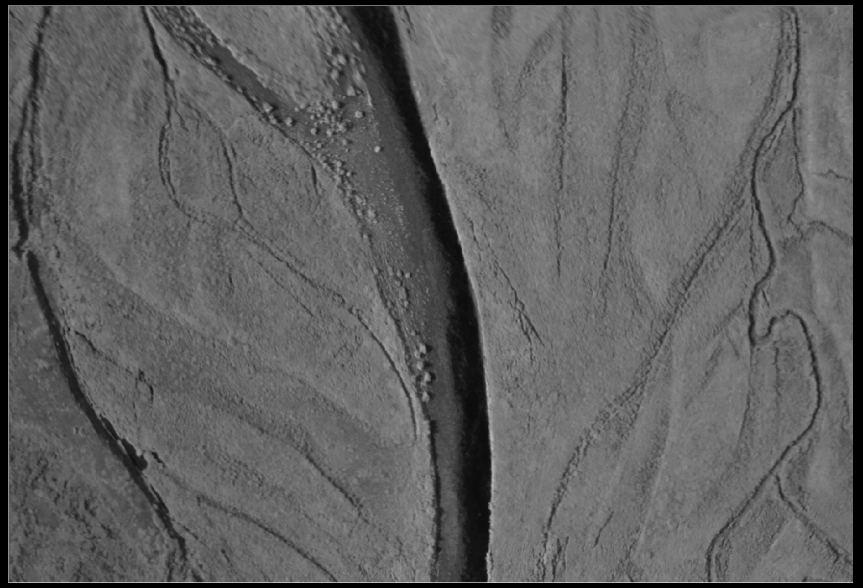
Pros

- Remotely sensed
- Global coverage
- Low operational cost

Cons

- Coarse resolution
- Weather interference
- High initial costs

The Rise of Remote Sensing of River Discharge



The Rise of Remote Sensing of River Discharge

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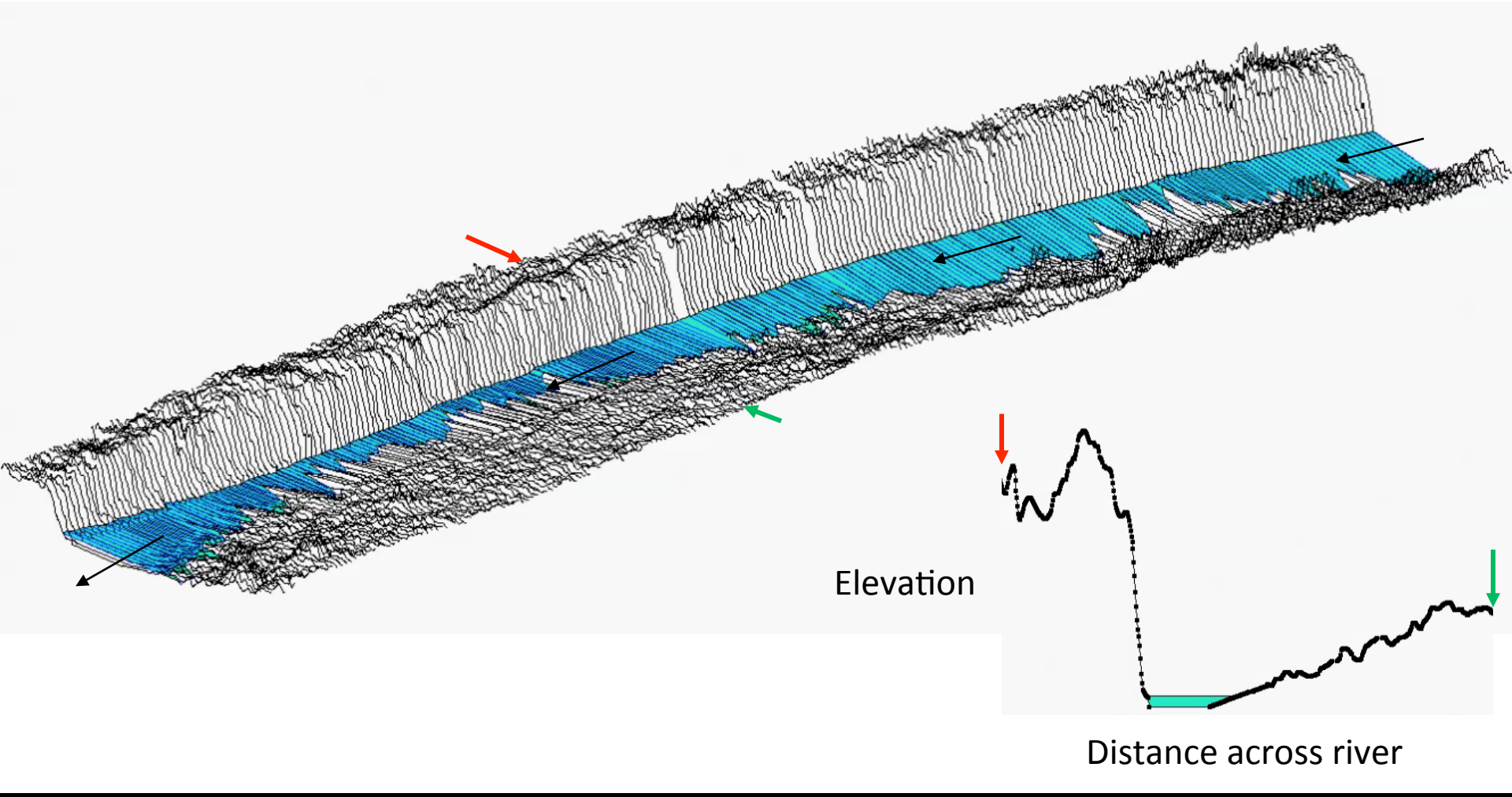
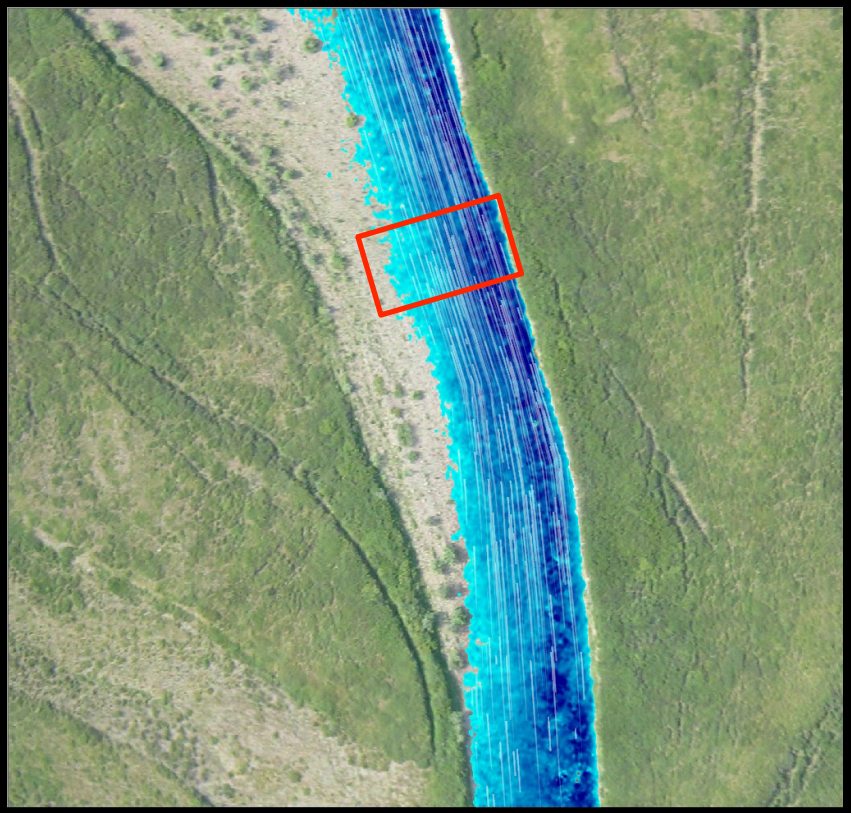
Hydraulic Modeling



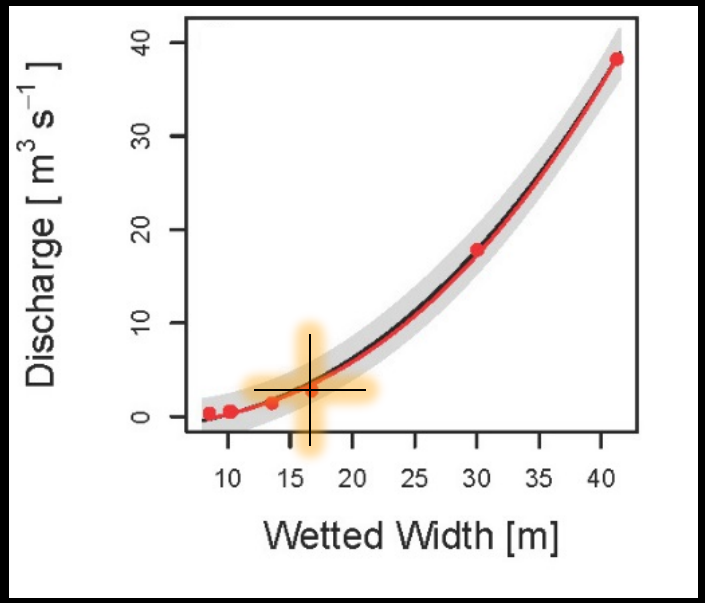
Estimating Discharge

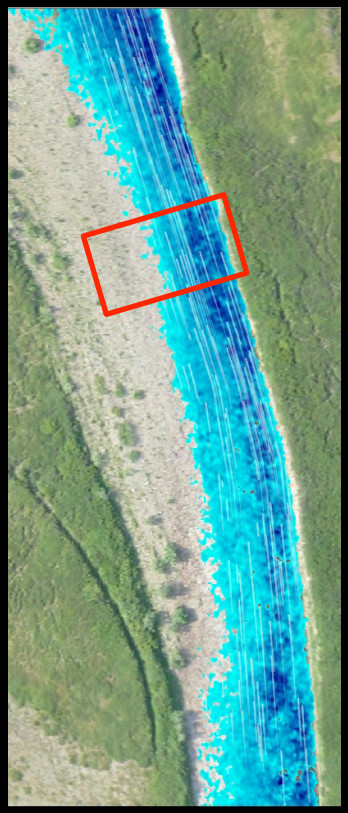
Aerial Imagery

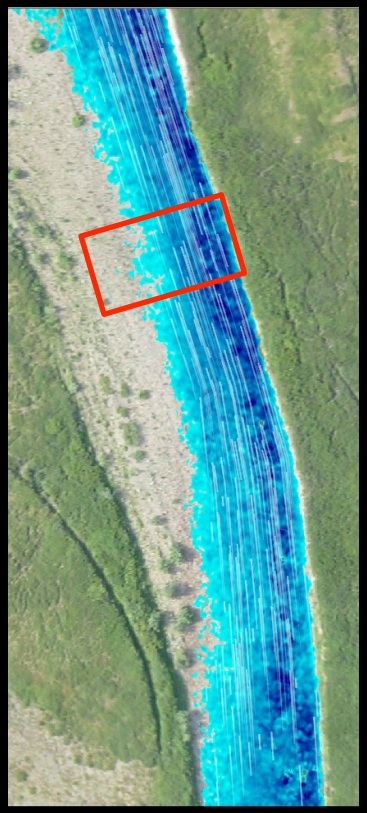


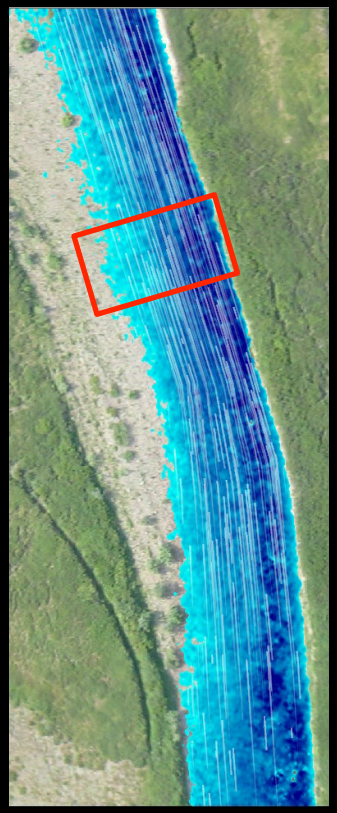
Model Output

Hydraulic Modeling



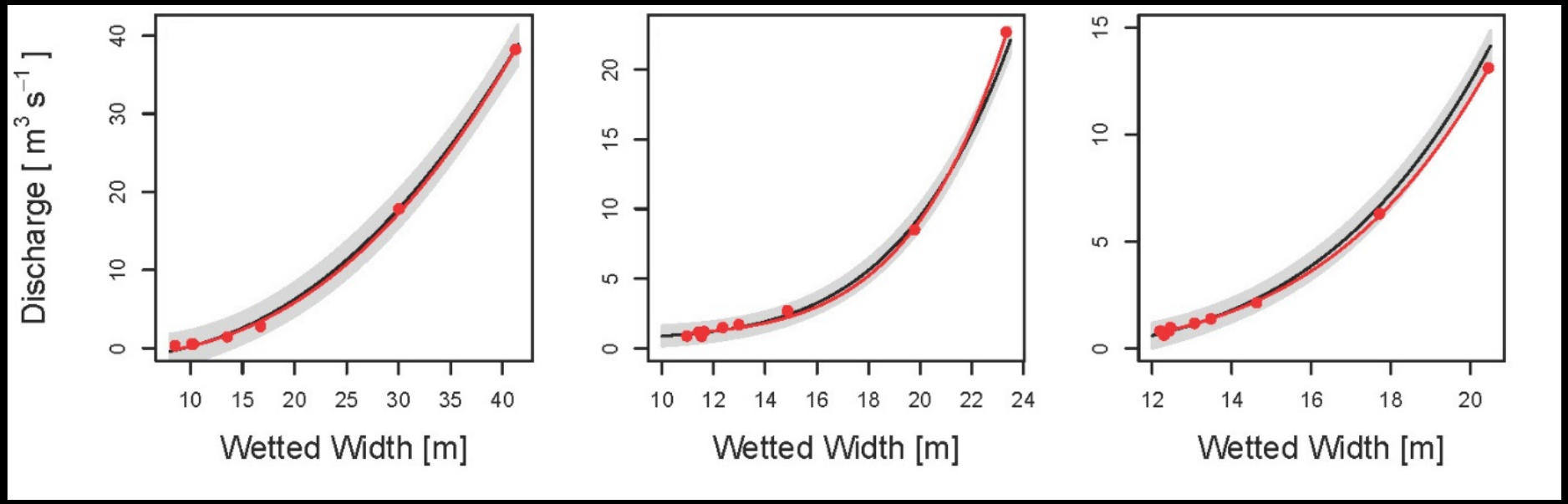






Observed Discharge:	2.8 $m^3 s^{-1}$	18.6 $m^3 s^{-1}$	38.3 $m^3 s^{-1}$
Modeled Discharge:	2.8 $m^3 s^{-1}$	17.8 $m^3 s^{-1}$	38.3 $m^3 s^{-1}$

Hydraulic Modeling



River Kilometer: 35

River Kilometer: 22

River Kilometer: 13

Conclusion

- River discharge can be accurately estimated through coupling of high resolution aerial imagery, photogrammetry, and hydraulic modeling

Significance

- This provides an opportunity to extend and densify our current gauging station network while avoiding issues with satellite based remote sensing

Limitations

- Requires:
  - A clear view of the channel (minimal overhanging vegetation)
  - Assumptions about basic channel shape
  - Wide range of widths in response to discharge

Next Steps

- Journal article in revision: "*Volumetric River Discharge Estimates from Passive Optical Remote Sensing"* Geophysical Research Letters

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